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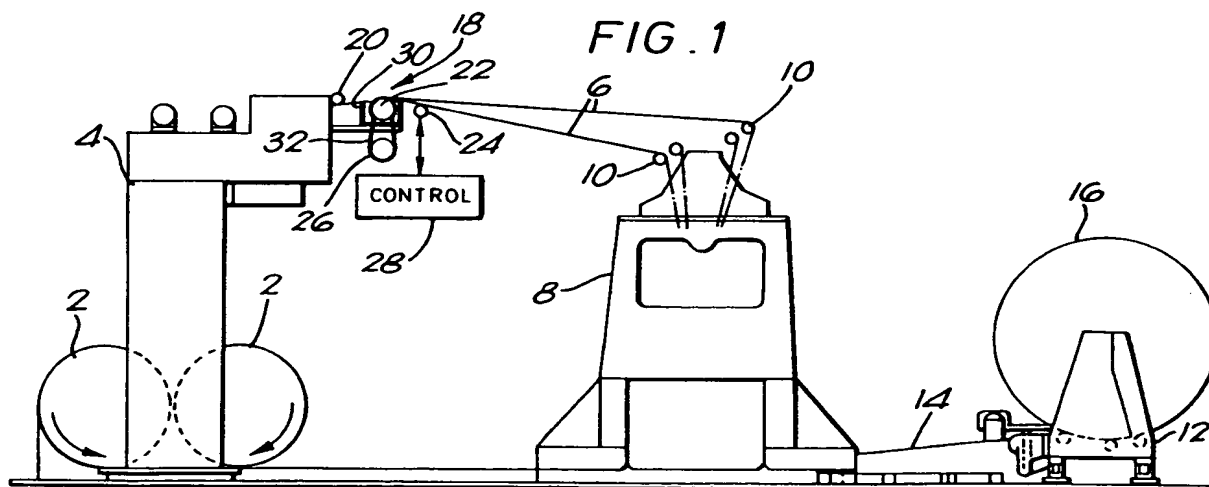
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**Apparatus and method for producing coloured knitted net.**

An apparatus for producing colored knitted net from a plurality of individual ribbons. A coloring apparatus (18) adapted to color selected ribbons of said plurality of individual ribbons (6) is provided

between the orientation and knitting stages in the net production process. After the selected ribbons have been colored, a knitting apparatus knits the plurality of individual ribbons into a Raschel net.



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Figure 1 shows an apparatus for the production of knitted netting including the coloring apparatus in accordance with the invention;

Figure 2 is a side sectional view of the coloring apparatus;

Figure 3 is a front partially sectional view of the coloring apparatus;

Figure 4 is a side sectional view of an alternative embodiment of the coloring apparatus;

Figure 5 is a perspective view of a further alternative embodiment of the coloring apparatus; and

Figure 6 is a perspective view of a further alternative embodiment of the coloring apparatus.

In the following detailed description of the drawings wherein several alternative embodiments of the invention are discussed, like components are given like numeral designations for convenience.

In Figure 1 is shown an apparatus for producing knitted netting. A primary film, e.g. linear low density polyethylene (LLDPE) is supplied on rolls 2. The primary film enters drawing unit 4 which slits and orients the primary film into individual ribbons 6. A drawing unit appropriate for this purpose is the ISO In-Line Drawing Unit for tape yarns from Karl Mayer (Germany). The individual ribbons 6 exit the drawing unit and enter knitting machine 8 via alignment rollers 10. Knitting machine 8 knits the individual ribbons 6 into a continuous Raschel knitted net 14. Appropriate knitting machines for this purpose is the Raschel machine from Karl Mayer (Germany) or similar machines. The continuous knitted netting 14 is wound onto roll 16 by winding machine 12.

In accordance with the invention, coloring apparatus 18, interposed between drawing unit 4, where the primary film is slit and oriented into individual ribbons, and knitting machine 8, where the knitted netting is actually knit. Coloring apparatus 18 includes alignment roller 20, coloring roller 22 and contact roller 24. Coloring roller 22 is located in vessel 30 and is connected by drive belt 32 to motor 26. Alternatively, the coloring roller may be driven by direct motor connection. Movement of contact roller 24 is controlled by control 28 to engage or disengage the individual ribbons 6 from contact with coloring roller 22.

It will be appreciated from Figure 1 that the preferred point in the net production process to color the individual ribbons is after the ribbons are oriented and before the ribbons are knitted into the net. If coloring is performed before orientation, the colored ink which colors the ribbon will be spread over an area 5-7 times longer than the original area because of the drawing process during ribbon orientation. The color will, therefore, become very dull. There may also be unexpected reactions of the colored ink on the ribbon because of the heat

which is needed for orientation.

In Figure 2 is shown a side sectional view of the coloring apparatus in accordance with the invention. The coloring apparatus includes a vessel 30 filled with a desired colored ink 34 to a predetermined level. The preferred colored ink includes a basic coloring agent NEWFLEX OD C/41 made by SUNCHEMICAL and may be mixed with a solvent that evaporates quickly. Various paints may also be used.

Inside the vessel there is a rough coloring roller 22 which has about half of its diameter immersed in the colored ink 34 and which rotates on an axle 36. The coloring roller 22 is a simple rough metal axle with a knurled roller surface. The axle 36 is supported by two sealed bearings 38. A length 40 of the axle protrudes through the walls of the vessel 30 and beyond the bearings 38. A small motor 26 rotates the coloring roller 22 via drive belt 32 connected to the protruding length of the axle.

The individual ribbons 6 pass transverse to the axial direction of the coloring roller 22 and contact the upper circumference of the coloring roller. When in contact with the coloring roller 22, the colored ink will color one side of the individual ribbons 6 as the coloring roller 22 rotates in colored ink 34.

In accordance with signals from a real time control system, rotation of the coloring roller may be controlled. Such control systems for the dyeing and printing of materials are known in the art and are described, e.g. in US Patent No.3,969,779, the disclosure of which is incorporated herein by reference. When the coloring roller does not rotate, colored ink does not reach the upper portion of the coloring roller circumference and the coloring of the individual ribbons ceases.

Alternatively, as shown in Figure 3, contact roller 24 may be positioned downstream of rough roller 22 and controlled by electromagnetic or pneumatic piston 44 to alter the path of travel of individual ribbons 6. When piston 44 is retracted, contact roller 24 allows contact between individual ribbons 6 and coloring roller 22. When extended, contact roller 24 alters the path of travel of individual ribbons 6 thereby preventing contact between the individual ribbons and coloring roller 22. In the extended position, no coloring of the individual ribbons occurs despite continued rotation of the coloring roller.

Two-sided coloring of the ribbons can be accomplished by repositioning the ribbons so that the ribbons contact the lower circumference of the coloring roller 22. In Figure 4, an entrance roller 46 and an exit roller 48 are provided at vessel 30 to direct the path of travel of individual ribbons 6 to the underside of coloring roller 22.

from said ink supply to said selected ribbons (6) of said plurality of individual ribbons.

7. An apparatus according to claim 6, characterised by means for controlling rotation of said coloring roller (22). 5
8. An apparatus according to claim 6 or claim 7 further characterised by means for controlling the contact between said coloring roller (22) and said selected ribbons (6) of said plurality of individual ribbons. 10
9. An apparatus according to claim 1, characterised in that said coloring apparatus (8) is characterised by: 15  
an ink supply (30); and  
a means (56) for transferring ink from said ink supply (30) to said individual ribbons (6) by capillary action. 20
10. An apparatus according to claim 9, further characterised by means for controlling the application of ink (30) by said means (56) for transferring to said selected ribbons of said plurality of individual ribbons (6). 25
11. An apparatus according to claim 1 wherein said coloring apparatus (8) is characterised by: an ink supply (30); and 30  
an ink jet (64) for applying ink from said ink supply to said selected ribbons of said plurality of individual ribbons (6).
12. An apparatus according to claim 11 characterised by means for controlling the operation of said ink jet (64). 35
13. A method for producing colored knitted net characterised by the steps of: 40  
providing a plurality of individual ribbons (6);  
coloring selected ribbons (6) of the plurality of individual ribbons; and  
knitting the plurality of individual ribbons in a net. 45
14. A method according to claim 13 further characterised by the step of knitting the plurality of individual ribbons into a Raschel net. 50
15. A method according to claim 13 or claim 14 further characterised by the step of applying ink from an ink supply to the selected ribbons of the plurality of individual ribbons with a coloring roller. 55
16. A method according to claim 15 further characterised by the step of controlling the rotation of

the coloring roller.

17. A method according to claim 15 or claim 16 further characterised by the step of controlling contact between the coloring roller and the selected ribbons of the plurality of individual ribbons.
18. A method according to claim 13 or claim 14 further characterised by the step of transferring ink from an ink supply to the selected ribbons of the plurality of individual ribbons by capillary action.
19. A method according to claim 18, further characterised by the step of controlling the transfer of ink between the ink supply and the selected ribbons of the plurality of individual ribbons.
20. A method according to claim 13 or claim 14 further characterised by the step of applying ink from an ink supply to the selected ribbons of the plurality of individual ribbons by an ink jet.
21. A method according to claim 20 further characterised by the step of controlling the operation of the ink jet.

FIG. 2

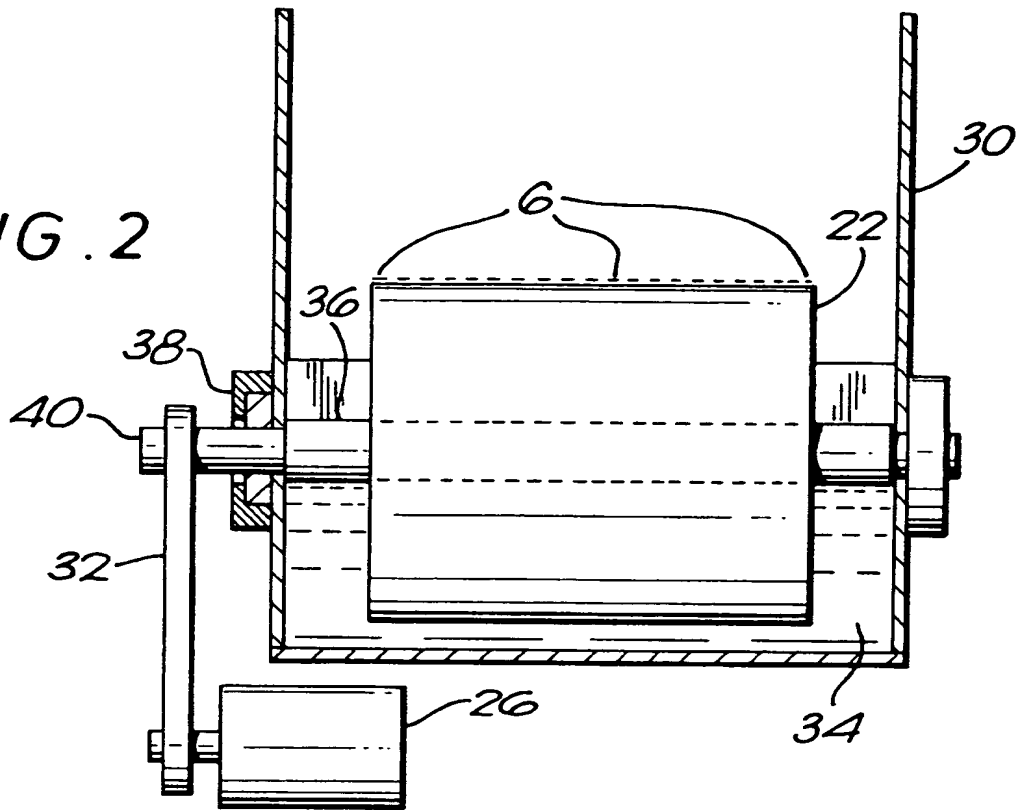
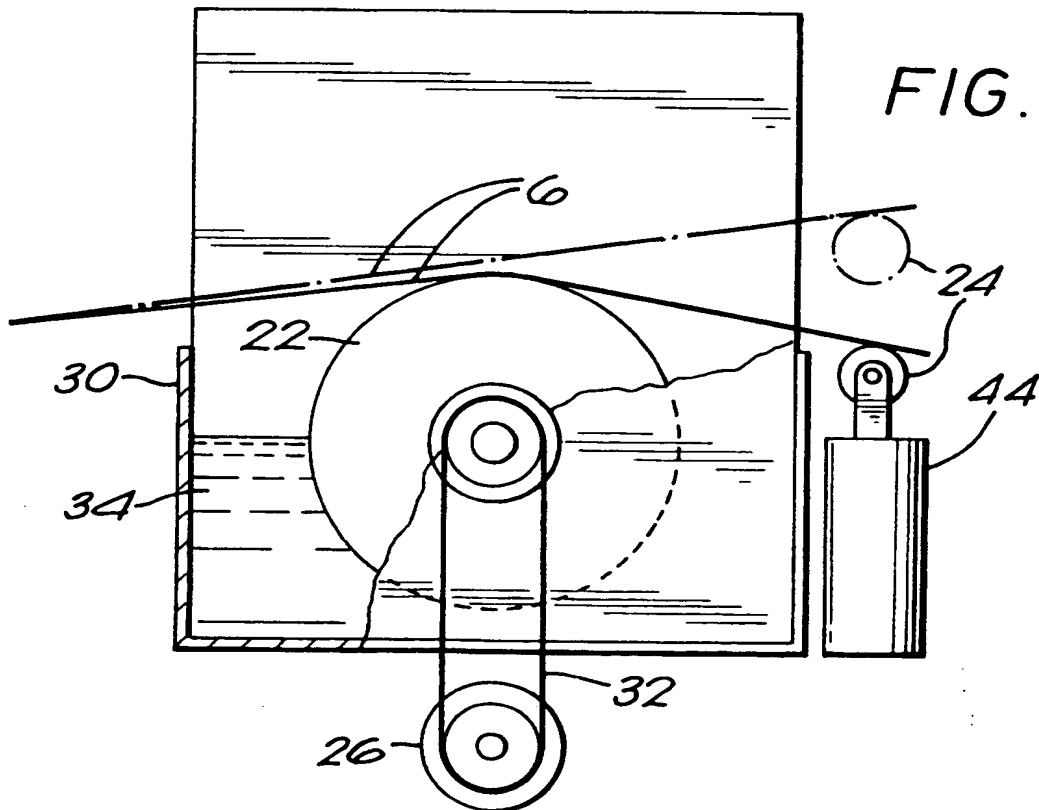


FIG. 3





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## EUROPEAN SEARCH REPORT

Application Number

EP 93 30 3160

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-4 060 999 (MARKS ET AL) * column 3, line 14 - column 5, line 61; figures 1-8 *	1,13	D04B35/36 D06B1/14 D06B11/00
A	---	2-4	
Y	BE-A-755 182 (BELLOLI) * page 4, line 4 - page 5, line 12; figure 1 *	1,13	
A	---	6,15	
A	FR-A-2 061 251 (FIRMA PH. LUDWIG ARZT) * claim 1; figures 1,2 *	1,5,13, 14	
A	US-A-4 015 550 (BARTENFELD ET AL) * column 4, line 8 - line 55; figures 1,2 *	1,6,8, 13,15,17	
A	GB-A-398 191 (BRITISH CELANESE LTD) * claim 1; figures 1,2 *	1,9,13, 18	
A	US-A-4 068 502 (ANDERSON) * column 2, line 43 - column 3, line 36; figures 1,2 *	1,11,12, 13,20,21	TECHNICAL FIELDS SEARCHED (Int. Cl.5)  D04B D06B
A	DE-A-2 437 918 (BAYER AG)		
A	US-A-3 952 552 (ROZNER)		
A	GB-A-318 840 (BRITISH CELANESE LTD)		
A	US-A-3 769 815 (PLOCH ET AL)		
D,A	US-A-3 969 779 (STEWART)		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 OCTOBER 1993	Examiner VAN GELDER P.A.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document  T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons  & : member of the same patent family, corresponding document			

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